

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

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in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 30 August 2000 (30.08.00)	<b>Applicant's or agent's file reference</b> 111205 BER
<b>International application No.</b> PCT/SE99/02405	<b>Priority date (day/month/year)</b> 17 December 1998 (17.12.98)
<b>International filing date (day/month/year)</b> 17 December 1999 (17.12.99)	
<b>Applicant</b> KOUVONEN, Ari	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

04 July 2000 (04.07.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Manu Berrod  Telephone No.: (41-22) 338.83.38
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# PCT REQUEST

The undersigned request that the present international application be processed according to the Patent Cooperation Treaty.

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89/868214

International Application No.

PCT/SE99/02405

International Filing Date

17-12-1999

Name of receiving Office and PCT International Application

The Swedish Patent Office  
PCT International Application

Applicant's or agent's file reference 111205 BER  
(if desired) (12 characters maximum)

<b>Box No. I</b>	<b>TITLE OF INVENTION</b>		
	An instrument and a method for measuring the degree of dust and dirt on a surface		
<b>Box No. II</b>	<b>APPLICANT</b>		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)		<input type="checkbox"/> This person is also inventor.	
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RO/SE Ari KOUVONEN/ Odalvägen 19 S-172 44 SUNDBYBERG Sweden		<input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
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ALBIHNS PATENTBYRÅ GÖTEBORG AB, P.O. Box 142, S-401 22 GÖTEBORG, Sweden		Facsimile No. +46 31 711 95 55	
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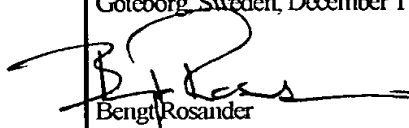
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17.12.1999

<b>Box No. VI PRIORITY CLAIM</b>		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country:	regional application:* regional Office	international application: receiving Office
item (1) 17 Dec 98 17-12-1998	9804398-7	Sweden		
item (2)				
item (3)				
<input checked="" type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): <u>9804398-7</u>				
<p>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See supplemental Box.</p>				
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<b>Choice of International Searching Authority (ISA)</b> (If two or more international Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA /SE		<b>Request to use results of earlier search; reference to that search</b> (if an earlier search has been carried out by or requested from the International Searching Authority): Date (day/month/year): 17-12-1998      Number 98/01487      Country (or regional Office) Sweden		
<b>Box No. VIII CHECK LIST; LANGUAGE OF FILING</b>				
This international application contains the following number of sheets: request: 3 ✓ description (excluding sequence listing part): 9 ✓ claims: 5 ✓ abstract: 1 ✓ drawings: 3 ✓ sequence listing part of description: _____ Total number of sheets: 21 ✓		This international application is accompanied by the item(s) marked below: 1. <input type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney, reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input checked="" type="checkbox"/> other (specify): Copy of ITS-report and copy of Office Action		
Figure of the drawings which should accompany the abstract: 2		Language of filing of the international application: Swedish		
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Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request). Göteborg, Sweden, December 17, 1999  Bengt Rosander				

1. Date of actual receipt of the purported international application: <b>17-12-1999</b>	2. Drawings:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	<input checked="" type="checkbox"/> received:
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5. International Searching Authority (if two or more are competent): <b>ISA/ SE</b>	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid

Date of receipt of the record copy by the International Bureau:	<b>02 FEBRUARY 2000</b>	For International Bureau use only <b>( 02.02.00 )</b>
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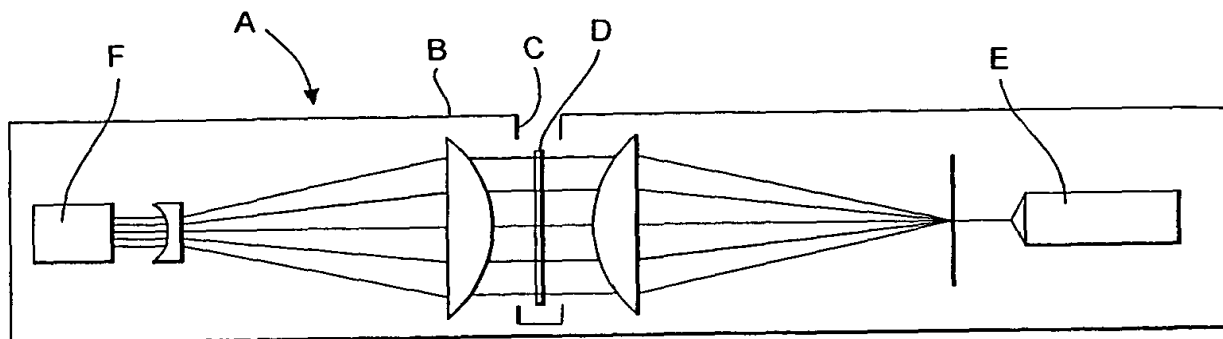


Fig.1

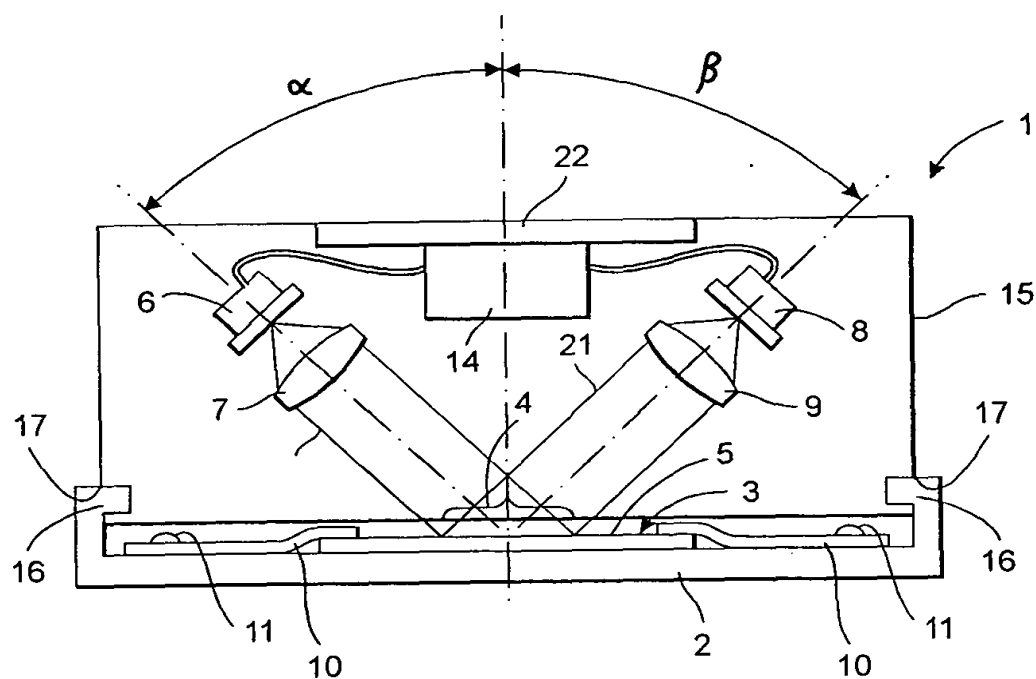
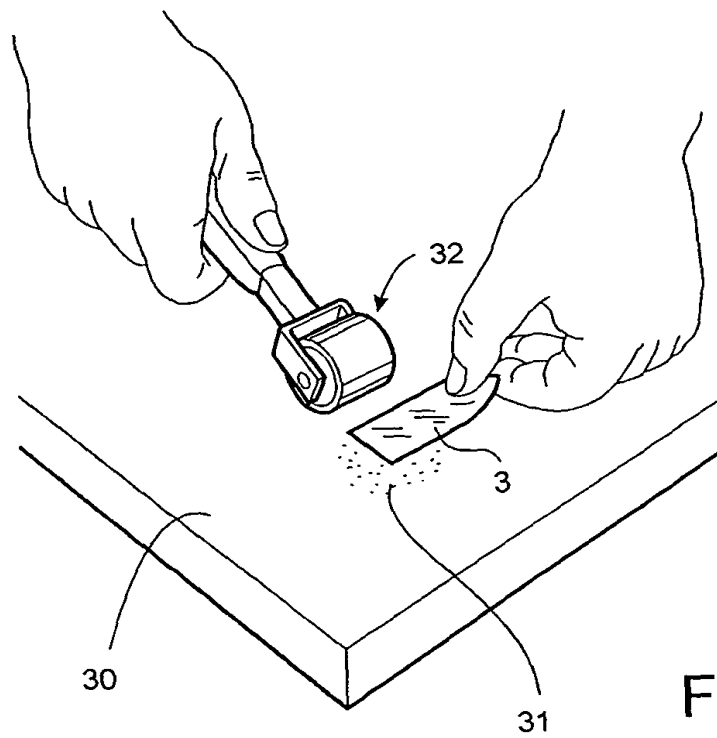
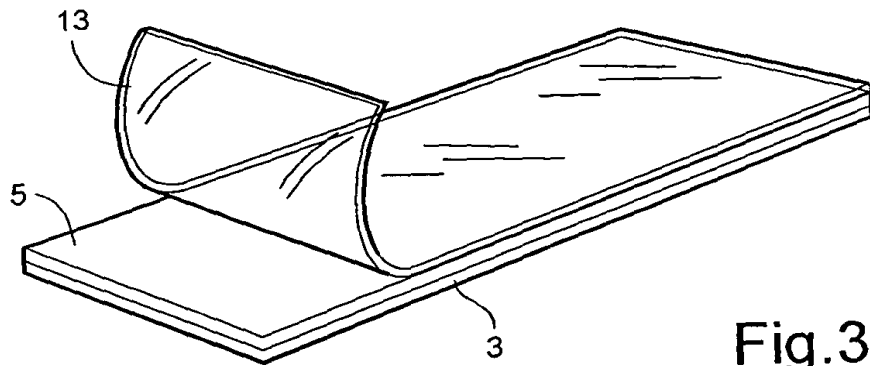


Fig.2

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**SUBSTITUTE SHEET**

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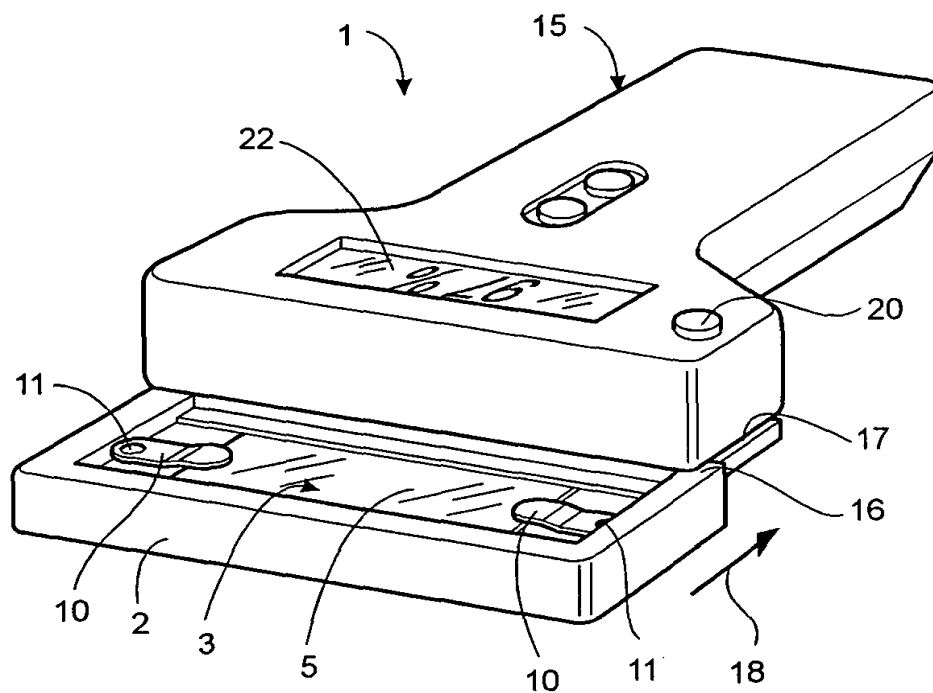


Fig.5

111205 BER  
1999-12-17

1

Mätinstrument och förfarande för mätning av damm- och smutsbeläggningsgrad på en yta.

#### TEKNISKT OMRÅDE:

5

Föreliggande uppfinning hänför sig till ett mätinstrument och ett förfarande för mätning av damm- och smutsbeläggninggrad på en yta, företrädesvis i syfte att kontrollera städningskvalitet efter utförd städning.

10

#### UPPFINNINGENS BAKGRUND:

Kontroll av städningskvalitet, dvs resultatet efter en genomförd städning, har  
15 traditionellt skett genom visuell bedömning av damm- och smutsbeläggningsgraden på ytor i den lokal där kontrollen genomförts. En nackdel med denna visuella metod är att resultatet nödvändigtvis blir subjektiv, vilket lätt leder till konflikter mellan den part som utfört städningen och den part som köpt städtjänsten i fall där städkvaliteten ifrågasatts. Vidare  
20 ger den visuella metoden inget underlag för objektiv statistik över städkvalitet, vilket eftersträvas i särskilt krävande miljöer såsom skolor, daghem och sjukhus. I sådana miljöer ställs i regel höga krav på städningen i syfte att bl. a. minska risken för dammallergi.

25 Idag pågår bl. a. ett Europeiskt samarbete där man söker utarbeta en standardnorm för hur resultatet av utförd städning skall göras mätbart. En objektiv mätmetod kan exempelvis även användas vid jämförelser mellan olika städmetoder. På marknaden finns idag en metod med vars hjälp sådana objektiva mätningar låter sig göras. Den kända metoden utnyttjar ett  
30 för ändamålet byggt mätinstrument, i vilket en laserstråle genomlyser en transparent provtagningsfolie med viss dammbeläggning, varvid foliens ljusgenomsläpplighet mätes genom att en fotodetektor på den i förhållande



- till laserstrålkällan motsatta sidan av provtagningsfolien registrerar ljusstyrkan hos det ljus som har passerat provtagningsfolien. Mätinstrumentet måste dock först ha kalibrerats genom att provtagningsfolien genomlysas i dammfritt tillstånd. Damm-och smutsbelägningsgraden anges därefter som
- 5 en funktion av skillnaden mellan den registrerade ljusstyrkan vid genomlysning av den dammfria provtagningsfolien och den något lägre ljusstyrkan som registreras vid genomlysning av den dammbelagda provtagningsfolien.
- 10 Provtagningsfolien som används vid den kända metoden är av samma typ som används av t.ex. polismyndigheter vid tagning av fingeravtryck. Folien är belagd med ett adhesivskikt som före foliens användning är skyddad bakom en skyddsfilm. Vid användning avlägsnas skyddsfilmen och provtagningsfolien anbringas med ett förutbestämt tryck mot den ytan vars
- 15 damm- och smutsbelägningsgrad skall mätas, varvid eventuella damm- och smutspartiklar från ytan fastnar i adhesivskiktet. Folien placeras därefter i en hållare i mätinstrumentet och genomlysas enligt ovan.
- En nackdel med det kända mätinstrumentet är emellertid att det bl. a. till följd
- 20 av den avancerade laserteknik som används är alltför dyrt för att vara intressant för inköp av mindre och medelstora städföretag, eller av städtjänstköparen själv. Dessutom är mätinstrumentets vikt och yttre mått sådana att det blir relativt otympligt för frekvent användning. En ytterligare nackdel med det kända mätinstrumentet är att det vid varje mätning kräver
- 25 en kalibrering med hänsyn till den individuella provtagningsfolien, vilket innebär att folien måste placeras två gånger i mätinstrumentet för varje mätpunkt i den städade lokalen. Dessa egenskaper hos mätinstrumentet har sammantaget lett till att endast ett fåtal specialutbildade och därmed kostbara konsulter idag utför kontroller av städkvalitet.

# REDOGÖRELSE FÖR UPPFINNINGEN:

Uppfinnaren har mot ovan beskrivna bakgrund identifierat ett behov bland  
5 mindre och medelstora städföretag, tillika bland städtjänstköpare såsom  
exempelvis skolor och sjukhus, att på ett enkelt och billigt sätt själva kunna  
utföra mätningar av städkvalitet med hjälp av ett mätinstrument som väl  
lämpar sig för detta ändamål. Föreliggande uppfinning tillhandahåller därför  
ett mätinstrument för mätning av damm- och smutsbeläggningsgrad på en  
10 yta, exempelvis för att kontrollera städningskvalitet, innefattande en hållare  
medelst vilken ett mätobjekt i form av en provtagningsfolie under mätning  
kvarhålls i ett plan i en av mätinstrumentet definierad mätzon, där nämnda  
provtagningsfolie är belagd med ett adhesivskikt vilket vid provtagning på  
ytan är inrättat att uppfånga eventuella damm- och smutspartiklar från  
15 nämnda yta. Mätinstrumentet utmärks enligt uppfinningen särskilt av:

- en ljuskälla inrättad att med snett infallande ljus belysa provtagningsfoliens  
adhesivskikt ;
- 20 - en fotodetektor inrättad att registrera ljusstyrkan hos det därvid från  
provtagningsfolien reflekterade ljuset; och
- en processor (14) inrättad att presentera ett mätvärde som representerar  
ytans (30) damm- och smutsbeläggningsgrad, där nämnda mätvärde är  
25 baserat på den av fotodetektorn (8) registrerade ljusstyrkan.

Uppfinningen omfattar även ett förfarande för mätning av damm- och  
smutsbeläggningsgrad på en yta, exempelvis för att kontrollera  
städningskvalitet, innefattande stegen:

- 30
- att en provtagningsfoliebelagd med ett adhesivskikt i ett första skede  
anbringas med ett förutbestämt tryck mot ytan vars damm- och

smutsbeläggingsgrad skall mätas, varvid eventuella damm- och smutspartiklar från nämnda yta fastnar i adhesivskiktet;

5 - att provtagningsfolien därefter avlägsnas från nämnda yta och placeras i en hållare, vilken åtminstone under mätning kvarhåller provtagningsfolien i ett plan i en av mätinstrumentet definierad mätzon;

10 - att en ljuskälla belyser provtagningsfoliens adhesivskikt med snett infallande ljus;

- att en fotodetektor registrerar ljusstyrkan hos det därvid från provtagningsfolien reflekterade ljuset; och

15 - att en processor (14) presenterar ett mätvärde som representerar ytans (30) damm- och smutsbeläggingsgrad, där nämnda mätvärde är baserat på den av fotodetektorn (8) registrerade ljusstyrkan.

20 I en fördelaktig utföringsform av uppfinningen används en glansmätare av den typ som mäter reflekterat ljus från en yta, som ett mätinstrument för mätning av damm- och smutsbeläggninggrad på en yta, exempelvis för att kontrollera städningens kvalitet, tillsammans med en provtagningsfolie belagd med ett adhesivskikt.

25 Uppfinningens övriga särdrag och fördelar framgår av den nedan följande beskrivningen av en föredragen utföringsform.

30 KORT BESKRIVNING AV RITNINGARNA:

Uppfinningen kommer nedan att närmare beskrivas genom en föredragen utföringsform under hänvisning till bifogade ritningar, på vilka:

fig. 1 visar en schematisk vy av ett mätinstrument enligt känd teknik;

5

fig. 2 visar en schematisk vy av ett mätinstrument enligt uppfinningen;

fig. 3 visar en förstorad perspektivvy över en provtagningsfolie enligt uppfinningen;

10

fig. 4 visar hur provtagningsfolien tryckes mot den yta vars damm- och smutsbeläggningsgrad skall mätas; och

fig. 5 visar en perpektivvy av ett mätinstrument enligt en föredragen utföringsform av uppfinningen, där provtagningsfolien placerats i hållaren inför mätningen.

15

## 20 BESKRIVNING AV FÖREDRAGEN UTFÖRINGSFORM:

I syfte att illustrera de principiella skillnaderna mellan känd teknik och uppfinningen, visas i

fig. 1 först ett mätinstrument (A) enligt känd teknik. Mätinstrumentet (A)

25

inrymmes därvid i ett avlångt hölje (B), vilket är försett med en öppning (C) för införing av en provtagningsfolie (D). Instrumentet fungerar i korthet genom att en laserstråle genererad från en laserstrålkälla (E) genomlyser en transparent provtagningsfolie (D) med viss dammbeläggning, varvid foliens ljusgenomsläpplighet mätes genom att en fotodetektor (F) på den i förhållande till laserstrålkällan (E) motsatta sidan av provtagningsfolien (D) registrerar ljusstyrkan hos det ljus som har passerat provtagningsfolien (D). Mätinstrumentet (A) måste dock först ha kalibrerats genom att

30

provtagningsfolien (D) genomlyses i dammfritt tillstånd. Damm-och smutsbeläggingsgraden anges därefter som en funktion av skillnaden mellan den registrerade ljusstyrkan vid genomlysning av den dammfria provtagningsfolien (D) och den något lägre ljusstyrkan som registreras vid  
5 genomlysning av den dammbelagda provtagningsfolien (D).

I fig 2. visas en schematisk principvy av ett mätinstrument 1 enligt en föredragen utföringsform av uppfinningen. Mätinstrumentet betecknas allmänt med hänvisningssiffran 1, och inrymmes i ett hölje 2. Höljet 2 är  
10 företrädesvis tillverkat av ett lätt material såsom plast eller aluminium, eftersom mätinstrumentet 1 är så dimensionerat att det kan hållas med en hand av en användare. Mätinstrumentet 1 är vidare försett med en hållare 2 medelst vilken ett mätobjekt i form av en provtagningsfolie 3 under mätning kvarhålls i ett plan i en av mätinstrumentet 1 definierad mätzon 4. Hållaren 2  
15 är medelst längsgående skenor 16 – vilka löper i spår 17 -rörligt anordnad relativt det övriga mätinstrumentet 1, varvid den kan skjutas mellan ett första, öppet läge som visas i fig. 5, och ett andra, stängt läge som framgår av fig 2.

Hållaren 2 är vidare försedd med infästningsorgan 10 för spänningsfri  
20 infästning av en provtagningsfolie 3. I det exempel som visas i fig. 2 och fig. 5 utgörs infästningsorganen 10 av tungelement förbundna med hållaren 2 medelst nitar 11. Infästningsorganen 10 kan naturligtvis vara utformade på andra lämpliga sätt. Det är viktigt att uppnå en spänningsfri infästning av provtagningsfolien 3, så att denna ligger plant i hållaren 2 utan buktningar,  
25 vilka buktningar annars kan påverka mätresultatet negativt. I en alternativ, ej visad utföringsform, är hållaren 2 löstagbart anordnad relativt det övriga mätinstrumentet 1. Kalibrering av mätinstrumentet 1 kan om högsta mätnoggrannhet önskas ske genom att en Damm- och smutsfri provtagningsfolie 3 placeras i hållaren 2, varvid mätning sker efter att en  
30 kalibreringsknapp 20 tryckts in. Härigenom kalibreras instrumentet just till den provtagningsfolie som används i vid den efterföljande provtagningen och mätningen, varigenom högsta mätnoggrannhet uppnås. Kalibrering behöver

dock ej nödvändigtvis ske inför varje mätning, eftersom ett motsvarande kalibreringsmätvärde avseende en genomsnittlig provtagningsfolie finns lagrat i en processor 14 i mätinstrumentet 1, varvid processorn 14 använder detta lagrade kalibreringsmätvärde då ingen kalibrering föregår den verkliga  
5 mätningen.

Provtagningsfolien 3, vilken visas förstörd i fig. 3, är av samma typ som används av t.ex. polismyndigheter vid tagning av fingeravtryck. Folien 3 är belagd med ett adhesivskikt 5 som före foliens 3 användning är skyddad  
10 bakom en skyddsfilm 13.

I fig. 4 visas hur provtagningsfolien 3 används vid provtagning på en yta 30. Vid användningen avlägsnas skyddsfilmen 13 och provtagningsfolien 3 anbringas med ett förutbestämt tryck – lämpligtvis medelst en för ändamålet  
15 specialtillverkad och på marknaden tillgänglig rulle 32 - mot den yta 30 vars damm- och smutsbeläggningsgrad skall mätas. Eventuella damm- och smutspartiklar 31 från ytan 30 fastnar då i adhesivskiktet 5. Provtagningsfolien 3 placeras därefter i mätinstrumentets 1 hållare 2 med adhesivskiktet 5 uppåt, såsom framgår av fig. 5, varvid hållaren 2 skjuts in till  
20 sitt stängda läge (ej visat) i pilens 18 riktning och mätningen sker.

Med hänvisning återigen till fig. 2 kommer nu mätinstrumentet 1 att närmare beskrivas. Således innefattar instrumentet 1 en ljuskälla 6 inrättad att med snett infallande ljus belysa provtagningsfoliens 3 adhesivskikt 5, vilket vid  
25 mätningen är så placerat i hållaren 2 att dess adhesivskikt 5 är vänt mot ljuskällan 6. Ljuskällan 6 är närmare bestämt inrättad att belysa provtagningsfoliens 3 adhesivskikt 5 med en infallsvinkel  $\alpha$  på mellan 20 och 80 grader, företrädesvis 60 grader. I det exempel som visas i fig. 2 är infallsvinkeln  $\alpha=60$  grader.

En optisk lins 7 är placerad mellan ljuskällan 6 och mätzonen 4, vilken lins 7 är anpassad för parallellriktning av ljusstrålarna 12 som träffar provtagningsfolien 3.

- 5 Vidare är en fotodetektor 8 inrättad att registrera ljusstyrkan hos det därvid från provtagningsfolien 3 reflekterade ljuset. En optisk lins 9 är därvid placerad mellan mätzonen 4 och fotodetektorn 8, vilken lins är anpassad för att koncentrera ljusstrålarna 21 som reflekteras från provtagningsfolien 3 mot fotodetektorn 8 med en reflexionsvinkel  $\beta$ .

10

- Mätinstrumentet är vidare försedd med en processor 14 inrättad att jämföra den av fotodetektorn 8 registrerade ljusstyrkan med ett förutbestämt kalibreringsvärde, samt att presentera ett på nämnda jämförelse baserat mätvärde, vilket mätvärde representerar ytans 30 (se fig. 4) damm- och smutsbeläggningsgrad. Mätvärdet presenteras i ett visningsfönster 22 upptaget i höljet 15, såsom tydligast framgår av fig. 5. Damm- och smutsbeläggningsgraden anges normalt som en procentdel av det mätvärde (100%) som uppnås för en ren, dvs. damm- och smutsfri yta.

20

Förfarandet enligt uppfinningen sker enligt stegen:

- att en provtagningsfolie 3 belagd med ett adhesivskikt 5 i ett första skede anbringas med ett förutbestämt tryck mot ytan 30 vars damm- och smutsbeläggningsgrad skall mätas, varvid eventuella damm- och smutspartiklar 31 från nämnda yta 30 fastnar i adhesivskiktet 5;
- att provtagningsfolien 3 därefter avlägsnas från nämnda yta 30 och placeras i en hållare 2, vilken åtminstone under mätning kvarhåller provtagningsfolien 3 i ett plan i en av mätinstrumentet 1 definierad mätzon 4;

30

- att en ljuskälla 6 belyser provtagningsfoliens 3 adhesivskikt 5 med snett infallande ljus;
- att en fotodetektor 8 registrerar ljusstyrkan hos det därvid från  
5 provtagningsfolien 3 reflekterade ljuset; och
- att en processor 14 jämför den av fotodetektorn 8 registrerade ljusstyrkan med ett förutbestämt kalibreringsvärde, samt presenterar ett på nämnda jämförelse baserat mätvärde, vilket mätvärde representerar ytans 30 damm-  
10 och smutsbelägningsgrad.

Med stor fördel kan en bärbar glansmätare av den kända typ som mäter reflekterat ljus från en yta och presenterar ett mätvärde i form av ett glanstal,  
15 anpassas för användning som ett mätinstrument 1 enligt uppfinningen, genom att en hållare 2 enligt ovanstående beskrivning monteras i anslutning till glansmätarens mätöppning. Härvid erhålles ett jämfört med den i fig. 1 ovan beskrivna, kända mätinstrumentet betydligt kompaktare och mer lätthanterligt mätinstrument, vars pris dessutom blir väsentligt lägre till följd  
20 av att en dylik glansmätare tillverkas i förhållandevis avsevärt större serier. Uppfinningen erbjuder därför en billig och effektiv metod för mätning av städkvalitet som med stor fördel kan användas av städföretag för egenkontroll, eller av städköpare såsom skolor, daghem och sjukhus.

25 Uppfinningen är ej begränsad till ovan beskrivna och på ritningarna illustrerade utföringsexempel, utan kan fritt varieras inom ramen för efterföljande patentkrav. Exempelvis kan hållaren 2 vara utformad som en svängbar lucka eller vara integrerad i en skyddsbricka som normalt medföljer glansmätare av det ovan beskrivna slaget i syfte att skydda mätöppningen då  
30 instrumentet ej används.



111205 BER  
1999-12-17

10

PATENTKRAV:

1. Mätinstrument (1) för mätning av damm- och smutsbeläggingsgrad på en  
5 yta (30), exempelvis för att kontrollera städningskvalitet, innefattande en  
hållare (2) medelst vilken ett mätobjekt i form av en provtagningsfolie (3)  
under mätning kvarhålls i ett plan i en av mätinstrumentet definierad mätzon  
(4), där nämnda provtagningsfolie (3) är belagd med ett adhesivskikt (5)  
vilket vid provtagning på ytan (30) är inrättat att uppfånga eventuella damm-  
10 och smutspartiklar (31) från nämnda yta,

**kännetecknat av,**

- en ljuskälla (6) inrättad att med snett infallande ljus belysa  
15 provtagningsfoliens (3) adhesivskikt (5);
  - en fotodetektor (8) inrättad att registrera ljusstyrkan hos det därvid från  
provtagningsfolien (3) reflekterade ljuset; och
  - 20 - en processor (14) inrättad att presentera ett mätvärde som representerar  
ytans (30) damm- och smutsbeläggingsgrad, där nämnda mätvärde är  
baserat på den av fotodetektorn (8) registrerade ljusstyrkan.
- 25 2. Mätinstrument (1) enligt patentkrav 1, **kännetecknat av**, att nämnda  
processor (14) är inrättad att jämföra den av fotodetektorn (8) registrerade  
ljusstyrkan med ett förutbestämt kalibreringsvärde, samt att presentera ett på  
nämnda jämförelse baserat mätvärde, vilket mätvärde representerar ytans  
(30) damm- och smutsbeläggingsgrad.

30

3. Mätinstrument (1) enligt patentkrav 1, **kännetecknat av**, att ljuskällan (6)  
5 är inrättad att belysa provtagningsfoliens (3) adhesivskikt (5) med en  
infallsvinkel ( $\alpha$ ) på mellan 20 och 80 grader, företrädesvis 60 grader.

4. Mätinstrument (1) enligt något eller några av föregående patentkrav,  
10 **kännetecknat av**, att provtagningsfolien (3) vid mätningen är så placerad i  
hållaren (2) att dess adhesivskikt (5) är vänt mot ljuskällan (6).

5. Mätinstrument (1) enligt något eller några av föregående patentkrav,  
15 **kännetecknat av**, att provtagningsfolien (3) vid mätningen är spänningslöst  
infäst i hållaren (2) medelst infästningsorgan (10), på ett sådant sätt att  
provtagningsfoliens (3) adhesivskikt (5) är huvudsakligen plant.

20 6. Mätinstrument (1) enligt något eller några av föregående patentkrav,  
**kännetecknat av**, att en optisk lins (7) är placerad mellan ljuskällan (6) och  
mätzonen (4), vilken lins (7) är anpassad för parallellriktning av ljusstrålarna  
(12) som träffar provtagningsfolien (3).

25 7. Mätinstrument (1) enligt något eller några av föregående patentkrav,  
**kännetecknat av**, att en optisk lins (9) är placerad mellan mätzonen (4) och  
fotodetektorn (8), vilken lins är anpassad för att koncentrera ljusstrålarna (21)  
som reflekteras från provtagningsfolien (3) mot fotodetektorn (8).

8. Mätinstrument (1) enligt något eller några av föregående patentkrav, **kännetecknat av**, att nämnda förutbestämda kalibreringsvärde motsvarar mätvärdet hos en damm- och smutsfri provtagningsfolie 3.

5

9. Mätinstrument (1) enligt något eller några av föregående patentkrav, **kännetecknat av**, att hållaren (2) är rörligt anordnad relativt det övriga mätinstrumentet (1).

10

10. Mätinstrument (1) enligt patentkrav 9, **kännetecknat av**, att hållaren (2) är löstagbart anordnad relativt det övriga mätinstrumentet (1).

15 11. Förfarande för mätning av damm- och smutsbelägningsgrad på en yta (30), exempelvis för att kontrollera städningskvalitet, innefattande stegen:

- att en provtagningsfolie (3) belagd med ett adhesivskikt (5) i ett första skede anbringas med ett förutbestämt tryck mot ytan (30) vars damm- och  
20 smutsbelägningsgrad skall mätas, varvid eventuella damm- och smutspartiklar (31) från nämnda yta (30) fastnar i adhesivskiktet (5);

- att provtagningsfolien (3) därefter avlägsnas från nämnda yta (30) och placeras i en hållare (2), vilken åtminstone under mätning kvarhåller  
25 provtagningsfolien (3) i ett plan i en av mätinstrumentet (1) definierad mätzon (4),

samt **kännetecknat av stegen:**

30 - att en ljuskälla (6) belyser provtagningsfoliens (3) adhesivskikt (5) med snett infallande ljus;

- att en fotodetektor (8) registrerar ljusstyrkan hos det därvid från provtagningsfolien (3) reflekterade ljuset; och

5 - att en processor (14) presenterar ett mätvärde som representerar ytans (30) damm- och smutsbelägningsgrad, där nämnda mätvärde är baserat på den av fotodetektorn (8) registrerade ljusstyrkan.

10 12. Förfarande enligt patentkrav 11, **kännetecknat av**, att nämnda processor (14) jämför den av fotodetektorn (8) registrerade ljusstyrkan med ett förutbestämt kalibreringsvärde, samt presenterar ett på nämnda jämförelse baserat mätvärde, vilket mätvärde representerar ytans (30) damm- och smutsbelägningsgrad.

15

13. Förfarande enligt patentkrav 11, **kännetecknat av**, att ljuskällan (6) belyser provtagningsfoliens (3) adhesivskikt (5) med en infallsvinkel ( $\alpha$ ) på mellan 20 och 80 grader, företrädesvis 60 grader.

20

14. Förfarande enligt något eller några av patentkraven 11 - 13, **kännetecknat av**, att provtagningsfolien (3) inför mätningen placeras i hållaren (2) på ett sådant sätt att dess adhesivskikt (5) är vänt mot ljuskällan (6).

25

15. Förfarande enligt något eller några av patentkraven 11 - 14, **kännetecknat av**, att provtagningsfolien (3) inför mätningen infästs spänningslöst i hållaren (2), på ett sådant sätt att provtagningsfoliens (3) adhesivskikt (5) förblir huvudsakligen plant under mätningen.

30

16. Användning av en glansmätare (1) av den typ som mäter reflekterat ljus från en yta, som ett mätinstrument för mätning av damm- och smutsbeläggninggrad på en yta (30), exempelvis för att kontrollera städningskvalitet, tillsammans med en provtagningsfolie (3) belagd med ett
- 5 adhesivskikt (5).

SAMMANDRAG:

Uppfinningen avser ett mätinstrument och ett förfarande för mätning av  
damm- och smutsbeläggningsgrad på en yta (30), exempelvis för att  
5 kontrollera städningskvalitet, innefattande en hållare (2) medelst vilken ett  
mätobjekt i form av en provtagningsfolie (3) under mätning kvarhålls i ett  
plan i en av mätinstrumentet definierad mätzon (4), där nämnda  
provtagningsfolie (3) är belagd med ett adhesivskikt (5) vilket vid provtagning  
på ytan (30) är inrättat att uppfånga eventuella damm- och smutspartiklar  
10 (31) från nämnda yta, där mätinstrumentet särskilt utmärks av:

- en ljuskälla (6) inrättad att med snett infallande ljus belysa  
provtagningsfoliens (3) adhesivskikt (5);
- 15 - en fotodetektor (8) inrättad att registrera ljusstyrkan hos det därvid från  
provtagningsfolien (3) reflekterade ljuset; och
- en processor (14) inrättad att jämföra den av fotodetektorn (8) registrerade  
ljusstyrkan med ett förutbestämt kalibreringsvärde, samt att presentera ett på  
20 nämnda jämförelse baserat mätvärde, vilket mätvärde representerar ytans  
(30) damm- och smutsbeläggningsgrad.

(Fig. 2)

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REC'D 23 MAR 2001

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT PCT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference 111205 BER	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE 99/02405	International filing date (day/month/year) 17-12-1999	Priority date (day/month/year) 17-12-1998
International Patent Classification (IPC) or national classification and IPC <sub>7</sub> G01N 21/88, G01N 21/55		
Applicant ACT-Advanced Cleaning Technics AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of \_\_\_\_\_ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  04-07-2000	Date of completion of this report  05-03-2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer  Jonas Andersson / itw Telephone No. 08-782 25 00

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/02405

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed
- ☐ the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the claims:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement) under article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the drawings:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**These elements were available or furnished to this Authority in the following language ENGLISH which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/02405

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-16</u>	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	<u>1-16</u>	NO
Industrial applicability (IA)	Claims	<u>1-16</u>	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)**

The invention relates to a measurement instrument for measuring dust and dirt on a surface, for example in order to monitor cleaning quality. The instrument comprises a holder in which a test film is placed during the measurement, a light source for illuminating the test film at an oblique angle, a photodetector intended to register the light intensity of reflected light, and a processor for presenting a measurement value representing the degree of dust and dirt on the surface. The invention also relates to a method for measuring dust and dirt on a surface as well as to the use of a gloss meter as a measurement instrument for measuring dust and dirt on a surface.

Cited WO91/14935 describes a method and a portable apparatus for cleaning control. A test film with an adhesive layer is applied to the surface to be tested. The test film is then placed in a holder in the instrument and illuminated by a light source at a right angle. The intensity of transmitted light is measured and a measurement value representing the cleaning quality is displayed.

Present invention differs from the technique of WO91/14935 in that the test film is illuminated under an oblique angle resulting in a light reflection measurement.

However, a measurement instrument for measuring particles on a surface by illuminating the surface under an oblique angle and detecting the reflected light, is known from cited EP0424504.

... / ...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/02405

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

It is considered obvious to a person skilled in the art to apply the technique of measuring the amount of particles on a surface by detecting reflected light, as known from EP0424504, in order to obtain a measure of dust and dirt present on a surface. A skilled person would therefore arrive at the present invention by modifying the method and apparatus for cleaning control known from WO91/14935 by applying the reflection measurement of EP0424504.

Consequently, the invention according to claims 1-16 is novel, has industrial applicability, but is not considered to involve an inventive step.

PATENT COOPERATION TREATY

09/868214

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 111205 BER	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE 99/02405	International filing date (day/month/year) 17-12-1999	Priority date (day/month/year) 17-12-1998
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- This report contains indications relating to the following items:
  - ☒ Basis of the report
  - ☐ Priority
  - ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - ☐ Lack of unity of invention
  - ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Certain documents cited
  - ☐ Certain defects in the international application
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Date of submission of the demand  04-07-2000	Date of completion of this report  05-03-2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer  Jonas Andersson / itw Telephone No. 08-782 25 00

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/02405

## I. Basis of the report

1. With regard to the **elements** of the international application:\*

- ☒ the international application as originally filed
- ☐ the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the claims:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement) under article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the drawings:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.These elements were available or furnished to this Authority in the following language ENGLISH which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheet/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/02405

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	<u>1-16</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	_____	YES
	Claims	<u>1-16</u>	NO
Industrial applicability (IA)	Claims	<u>1-16</u>	YES
	Claims	_____	NO

**2. Citations and explanations (Rule 70.7)**

The invention relates to a measurement instrument for measuring dust and dirt on a surface, for example in order to monitor cleaning quality. The instrument comprises a holder in which a test film is placed during the measurement, a light source for illuminating the test film at an oblique angle, a photodetector intended to register the light intensity of reflected light, and a processor for presenting a measurement value representing the degree of dust and dirt on the surface. The invention also relates to a method for measuring dust and dirt on a surface as well as to the use of a gloss meter as a measurement instrument for measuring dust and dirt on a surface.

Cited WO91/14935 describes a method and a portable apparatus for cleaning control. A test film with an adhesive layer is applied to the surface to be tested. The test film is then placed in a holder in the instrument and illuminated by a light source at a right angle. The intensity of transmitted light is measured and a measurement value representing the cleaning quality is displayed.

Present invention differs from the technique of WO91/14935 in that the test film is illuminated under an oblique angle resulting in a light reflection measurement.

However, a measurement instrument for measuring particles on a surface by illuminating the surface under an oblique angle and detecting the reflected light, is known from cited EP0424504.

... / ...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/02405

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

It is considered obvious to a person skilled in the art to apply the technique of measuring the amount of particles on a surface by detecting reflected light, as known from EP0424504, in order to obtain a measure of dust and dirt present on a surface. A skilled person would therefore arrive at the present invention by modifying the method and apparatus for cleaning control known from W091/14935 by applying the reflection measurement of EP0424504.

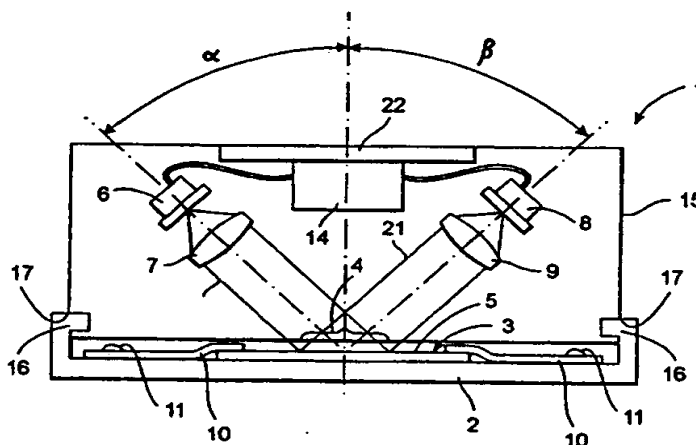
Consequently, the invention according to claims 1-16 is novel, has industrial applicability, but is not considered to involve an inventive step.



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>G01N 21/88, 21/55</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/39566</b> <b>(43) International Publication Date:</b> 6 July 2000 (06.07.00)
<b>(21) International Application Number:</b> PCT/SE99/02405 <b>(22) International Filing Date:</b> 17 December 1999 (17.12.99) <b>(30) Priority Data:</b> 9804398-7 17 December 1998 (17.12.98) SE <b>(71) Applicant (for all designated States except US):</b> ACT - ADVANCED CLEANING TECHNICS AB [SE/SE]; Box 10, S-515 21 Viskafors (SE). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> KOUVONEN, Ari [SE/SE]; Odalvägen 19, S-172 44 Sundbyberg (SE). <b>(74) Agents:</b> ANDERSSON, Per et al.; Albihs Patentbyrå Göteborg AB, P.O. Box 142, S-401 22 Göteborg (SE).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LT, LU, LV, MA, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

**(54) Title:** AN INSTRUMENT AND A METHOD FOR MEASURING THE DEGREE OF DUST AND DIRT ON A SURFACE

**(57) Abstract**

The invention relates to a measurement instrument and a method for measuring the degree of covering of dust and dirt on a surface (30), for example in order to monitor cleaning quality, comprising a holder (2) by means of which a measurement object in the form of a test film (3) is held, during measurement, in a plane in a measurement zone (4) defined by the measurement instrument, the said test film (3) being coated with an adhesive layer (5) which, during testing on the surface (30), is intended to pick up any dust and dirt particles (31) from the said surface, the measurement instrument being distinguished in particular by: a light source (6) intended to illuminate the test film (3); a photodetector (8) intended to register the light intensity of the light reflected from the test film (3); and a processor (14) intended to compare the light intensity registered by the photodetector (8) with a predetermined calibration value, and to present a measurement value based on the said comparison, which measurement value represents the degree of covering of dust and dirt on the surface (30).

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DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						



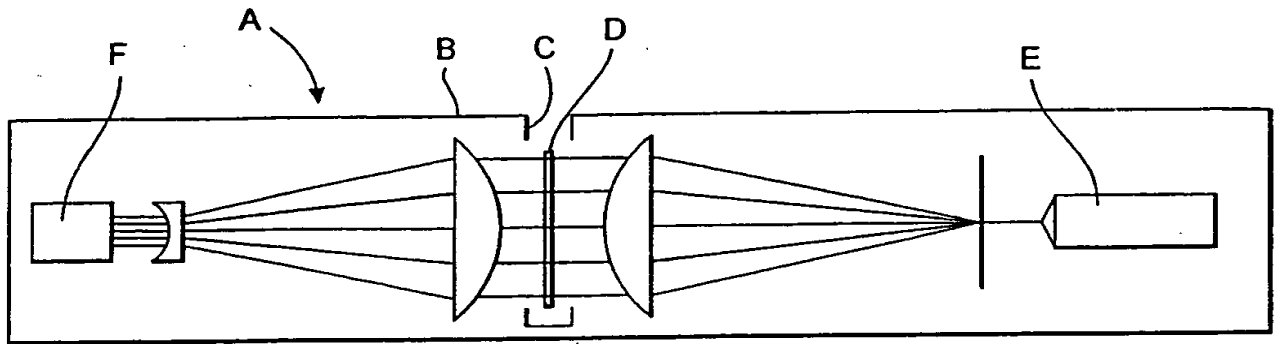


Fig.1

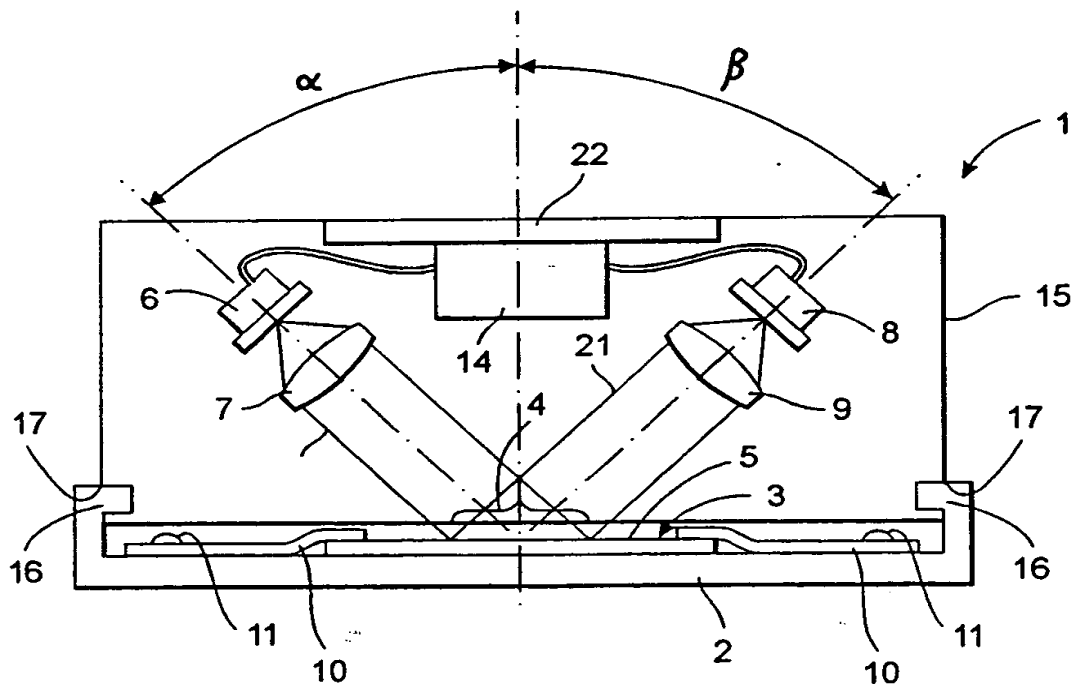


Fig.2

2/3

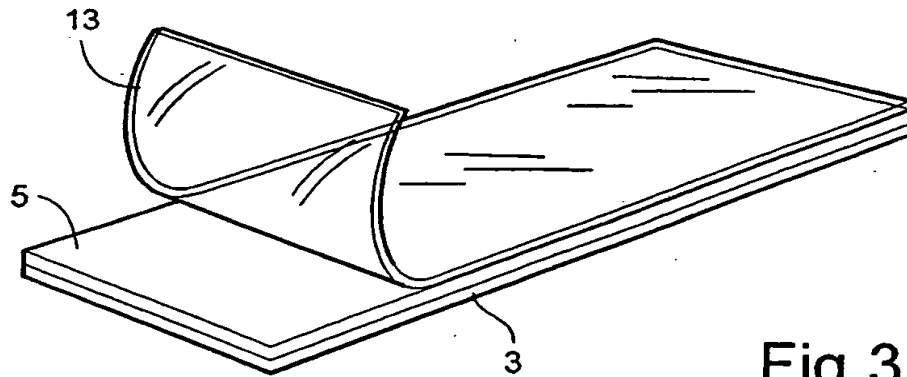


Fig.3

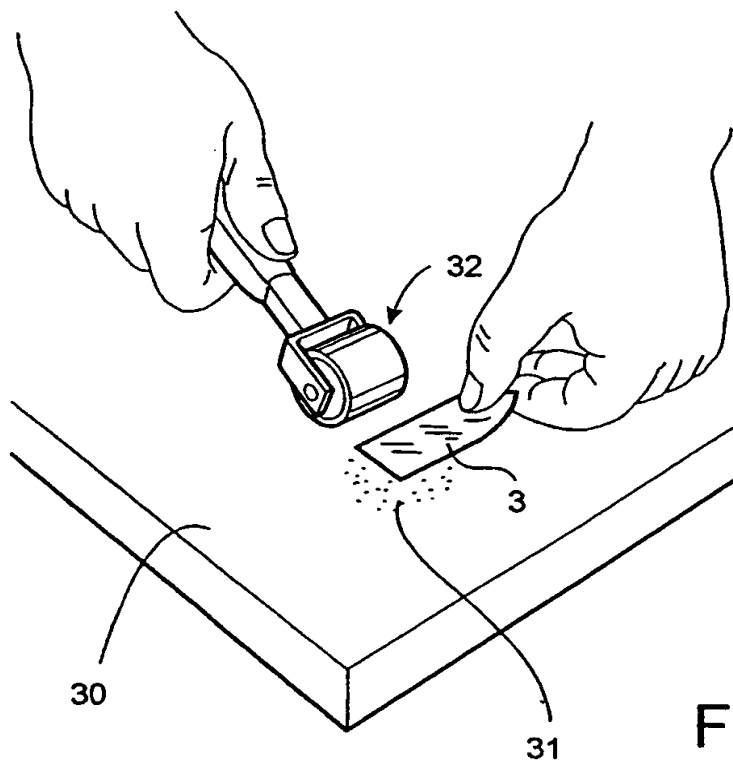


Fig.4

3/3

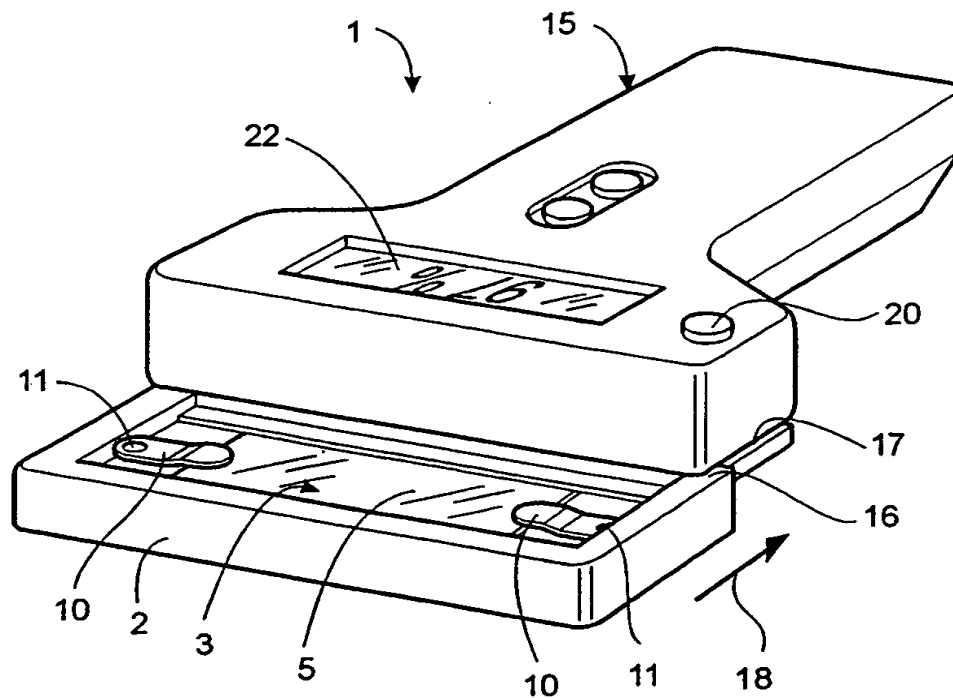


Fig.5

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 99/02405

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G01N 21/88, G01N 21/55

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 9114935 A1 (ABK BYGGE-OG MILJÖTEKNIK A/S), 3 October 1991 (03.10.91), page 1, line 1 - page 4, line 15, figures 1-3, abstract --	1-16
Y	EP 0414504 A2 (XEROX CORPORATION), 27 February 1991 (27.02.91), column 10, line 7 - column 11, line 4, figure 3, abstract --	1-16
A	US 5412221 A (IHLEFELD M. CURTIS ET AL), 2 May 1995 (02.05.95), column 3, line 20 - column 4, line 48, figures 1-3 --	1-16

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

9 March 2000

Date of mailing of the international search report

17-04-2000

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/02405

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4750140 A (YUICHIRO ASANO ET AL), 7 June 1988 (07.06.88), figure 3 --	1-16
A	WO 9848261 A1 (LEIRFALL,LASSE), 29 October 1998 (29.10.98) --	1-16
A	US 5461481 A (HOWARD BOWEN ET AL), 24 October 1995 (24.10.95) -- -----	1-16

# INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/SE 99/02405

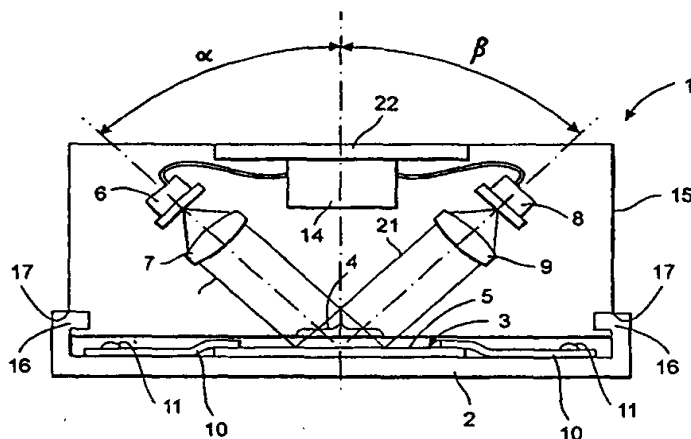
Patent document cited in search report			Publication date	Patent family member(s)	Publication date
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				DK 163538 B,C	09/03/92
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				EP 0183270 A,B	04/06/86
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				JP 62126331 A	08/06/87
WO	9848261	A1	29/10/98	AU 7086098 A	13/11/98
				NO 971822 A	19/10/98
US	5461481	A	24/10/95	NONE	



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : <b>G01N 21/88, 21/55</b>	<b>A1</b>	(11) International Publication Number: <b>WO 00/39566</b> (43) International Publication Date: <b>6 July 2000 (06.07.00)</b>
<p>(21) International Application Number: <b>PCT/SE99/02405</b></p> <p>(22) International Filing Date: <b>17 December 1999 (17.12.99)</b></p> <p>(30) Priority Data: <b>9804398-7</b>      <b>17 December 1998 (17.12.98)</b>      <b>SE</b></p> <p>(71) Applicant (for all designated States except US): <b>ACT - ADVANCED CLEANING TECHNICS AB [SE/SE]; Box 10, S-515 21 Viskafors (SE).</b></p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): <b>KOUVONEN, Ari [SE/SE]; Odalvägen 19, S-172 44 Sundbyberg (SE).</b></p> <p>(74) Agents: <b>ANDERSSON, Per et al.; Albihns Patentbyrå Göteborg AB, P.O. Box 142, S-401 22 Göteborg (SE).</b></p>	<p>(81) Designated States: <b>AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LT, LU, LV, MA, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Swedish).</i></p>	

(54) Title: AN INSTRUMENT AND A METHOD FOR MEASURING THE DEGREE OF DUST AND DIRT ON A SURFACE



## (57) Abstract

The invention relates to a measurement instrument and a method for measuring the degree of covering of dust and dirt on a surface (30), for example in order to monitor cleaning quality, comprising a holder (2) by means of which a measurement object in the form of a test film (3) is held, during measurement, in a plane in a measurement zone (4) defined by the measurement instrument, the said test film (3) being coated with an adhesive layer (5) which, during testing on the surface (30), is intended to pick up any dust and dirt particles (31) from the said surface, the measurement instrument being distinguished in particular by: a light source (6) intended to illuminate the adhesive layer (5) of the test film (3) with obliquely incident light; a photodetector (8) intended to register the light intensity of the light reflected from the test film (3); and a processor (14) intended to compare the light intensity registered by the photodetector (8) with a predetermined calibration value, and to present a measurement value based on the said comparison, which measurement value represents the degree of covering of dust and dirt on the surface (30).

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5       An instrument and a method for measuring the degree  
of dust and dirt on a surface

TECHNICAL FIELD:

10       The present invention relates to a measurement instrument and a method  
for measuring the degree of covering of dust and dirt on a surface,  
preferably for the purpose of monitoring cleaning quality after cleaning.

BACKGROUND TO THE INVENTION:

15       Monitoring of cleaning quality, that is to say the result achieved after  
cleaning, has traditionally been done by visual assessment of the degree of  
covering of dust and dirt on surfaces in the premises where the monitoring  
is carried out. A disadvantage of this visual method is that the result is  
necessarily subjective, which can easily lead to disputes between the party  
20       which carried out the cleaning and the party which purchased the cleaning  
services if the quality of the cleaning is called into question. In addition, the  
visual method does not provide a basis for objective statistical evaluation of  
cleaning quality, which is sought in especially demanding environments  
such as schools, day nurseries and hospitals. In environments such as  
25       these, stringent demands are generally placed on cleaning, among other  
reasons in order to reduce the risk of dust allergy.

Work is at present being done at European level in an attempt to draw up a  
standard for evaluating the result of cleaning. An objective measurement  
30       method can also be used, for example, for drawing comparisons between  
different cleaning methods. A method is at present available on the market  
which permits such objective measurements. The known method uses a  
measurement instrument specially built for the purpose, in which a laser  
beam passes through a transparent test film with a certain covering of dust,  
35       the light transmission of the film being measured by means of a  
photodetector, on the opposite side of the test film from the laser beam  
source, registering the intensity of the light which has passed through the  
test film. However, the measurement instrument must first have been  
calibrated by light being passed through the test film in the dust-free state.

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The degree of covering of dust and dirt is then indicated as a function of the difference between the registered light intensity on passing light through the dust-free test film and the slightly lower light intensity which is registered on passing light through the dust-covered test film.

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The test film used in the known method is of the same type used, for example, by police authorities when taking finger prints. The film is coated with an adhesive layer which, prior to the film being used, is protected by a protective film. Upon use, the protective film is removed and the test film is applied with a predetermined pressure against the surface whose covering of dust and dirt is to be measured, with any dust and dirt particles from the surface attaching themselves to the adhesive layer. The film is then placed in a holder in the measurement instrument and light is passed through it in accordance with the above.

15

However, a disadvantage of the known measurement instrument is that, because of the advanced laser technology used, it is too expensive to be purchased by small or medium-sized cleaning companies, or by the actual party paying for the cleaning services. In addition, the weight and external dimensions of the measurement instrument are such that it is rather impractical for frequent use. A further disadvantage of the known measurement instrument is that, for each measurement, it has to be calibrated with respect to the individual test film, which means that the film has to be placed twice in the measurement instrument for each point of measurement in the premises which have been cleaned. These features of the measurement instrument, taken together, have led to a situation where at the present time only a small number of specially trained and therefore expensive consultants carry out monitoring of cleaning quality.

## 30 DESCRIPTION OF THE INVENTION:

Against this background, the inventor has identified a need among smaller and medium-sized cleaning companies, and among cleaning contractors such as schools and hospitals, for them to be able to carry out cleaning quality measurements themselves in a simple and inexpensive manner using a measurement instrument which is especially suited for this purpose. The present invention therefore makes available a measurement instrument for measuring the degree of covering of dust and dirt on a surface, for example in order to monitor cleaning quality, comprising a

35

- 3 -

holder by means of which a measurement object in the form of a test film is held, during measurement, in a plane in a measurement zone defined by the measurement instrument, the said test film being coated with an adhesive layer which, during testing of the surface, is intended to pick up  
5 any dust and dirt particles from the said surface. The measurement instrument according to the invention is characterized in particular by:

- a light source intended to illuminate the adhesive layer of the test film with obliquely incident light;

10

- a photodetector intended to register the light intensity of the light reflected from the test film; and

15

- a processor (14) intended to present a measurement value which represents the degree of covering of dust and dirt on the surface (30), the said measurement value being based on the light intensity registered by the photodetector (8).

20

The invention also relates to a method for measuring the degree of covering of dust and dirt on a surface, for example in order to monitor cleaning quality, comprising the following stages:

25

- in a first stage, a test film coated with an adhesive layer is applied with a predetermined pressure against the surface whose degree of covering of dust and dirt is to be measured, with any dust and dirt particles from the said surface attaching themselves to the adhesive layer;

30

- the test film is then removed from the said surface and is placed in a holder which, at least during measurement, holds the test film in a plane in a measurement zone defined by the measurement instrument,

- a light source illuminates the adhesive layer of the test film with obliquely incident light;

35

- a photodetector registers the light intensity of the light reflected from the test film; and

- a processor (14) presents a measurement value which represents the degree of covering of dust and dirt on the surface (30), the said

- 4 -

measurement value being based on the light intensity registered by the photodetector (8).

5 In an advantageous embodiment of the invention, a gloss meter, of the type which measures light reflected from a surface, is used as a measurement instrument for measuring the degree of covering of dust and dirt on a surface, for example in order to monitor cleaning quality, together with a test film coated with an adhesive layer.

10 Other features and advantages of the invention will become evident from the following description of a preferred embodiment.

#### BRIEF DESCRIPTION OF THE DRAWINGS:

15 The invention will be described in greater detail below on the basis of a preferred embodiment and with reference to the attached drawings, in which:

20 Fig. 1 shows a diagrammatic view of a measurement instrument according to the prior art;

Fig. 2 shows a diagrammatic view of a measurement instrument according to the invention;

25 Fig. 3 shows an enlarged perspective view of a test film according to the invention;

Fig. 4 shows how the test film is pressed against the surface whose degree of covering of dust and dirt is to be measured; and

30 Fig. 5 shows a perspective view of a measurement instrument according to a preferred embodiment of the invention, where the test film has been placed in the holder prior to measurement.

#### 35 DESCRIPTION OF A PREFERRED EMBODIMENT:

In order to illustrate the main differences between the prior art and the invention, a measurement instrument (A) according to the prior art is first shown in Fig. 1. The measurement instrument (A) is here accommodated

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- in an oblong casing (B) which is provided with an opening (C) for introduction of a test film (D). In brief, the instrument works by means of a laser beam generated from a laser beam source (E) passing through a transparent test film (D) with a certain covering of dust, the light transmission of the film being measured by means of a photodetector (F), on the opposite side of the test film (D) from the laser beam source (E), registering the intensity of the light which has passed through the test film (D). However, the measurement instrument (A) will first have to have been calibrated by light being passed through the test film (D) in the dust-free state. The degree of covering of dust and dirt is then indicated as a function of the difference between the registered light intensity when light is passed through the dust-free test film (D) and the slightly lower light intensity which is registered when light is passed through the dust-covered test film (D).
- Fig. 2 shows a diagrammatic outline view of a measurement instrument 1 according to a preferred embodiment of the invention. The measurement instrument is designated in general by reference number 1 and is accommodated in a casing 2. The casing 2 is preferably made of a light-weight material such as plastic or aluminium, since the measurement instrument 1 is dimensioned such that it can be held in one hand by a user. The measurement instrument 1 is further provided with a holder 2 by means of which a measurement object in the form of a test film 3 is maintained in a plane in a measurement zone 4 defined by the measurement instrument 1. By means of longitudinal rails 16, which run on tracks 17, the holder 2 can be moved relative to the rest of the measurement instrument 1, and it can be pushed between a first, open position as shown in Fig. 5 and a second, closed position as shown in Fig. 2.
- The holder 2 is further provided with securing members 10 for securing a test film 3 without tensioning. In the example shown in Fig. 2 and Fig. 5, the securing members 10 consist of tongue elements connected to the holder 2 by means of rivets 11. The securing members 10 can of course be formed in another way. It is important for the test film 3 to be secured without tensioning such that it lies flat in the holder 2 without bending, which bends would otherwise have an adverse effect on the measurement result. In an alternative embodiment (not shown), the holder 2 is arranged so that it can be detached from the rest of the measurement instrument 1. Where maximum measurement accuracy is required, the measurement instrument

- 6 -

1 can be calibrated by means of a dust-free and dirt-free test film 3 being placed in the holder 2, with measurement taking place after a calibration button 20 has been depressed. In this way, the instrument is calibrated exactly to the test film which is being used in the subsequent test and measurement, as a result of which the greatest accuracy of measurement is achieved. However, calibration does not necessarily have to take place before measurement, since a corresponding calibration measurement value related to an average test film is stored in a processor 14 in the measurement instrument 1, with the processor 14 using this stored calibration measurement value when no calibration is carried out before the actual measurement.

The test film 3, which is shown enlarged in Fig. 3, is of the same type as is used, for example, by police authorities when taking finger prints. The film 3 is coated with an adhesive layer 5 which, before the film 3 is used, is protected under a protective film 13.

Fig. 4 shows how the test film 3 is used for testing a surface 30. The protective film 13 is removed and the test film 3 is applied with a predetermined pressure – preferably by means of a roller 32 specially designed for the purpose and available on the market – against the surface 30 whose degree of covering with dust and dirt is to be measured. Any dust and dirt particles 31 from the surface 30 attach themselves to the adhesive layer 5. The test film 3 is then placed in the holder 2 of the measurement instrument 1 with the adhesive layer 5 facing upwards, as can be seen in Fig. 5, and the holder 2 is pushed in to its closed position (not shown) in the direction of arrow 18 and the measurement is carried out.

Referring again to Fig. 2, the measurement instrument 1 will now be described in detail. Thus, the instrument 1 comprises a light source 6 intended to illuminate the adhesive layer 5 of the test film 3 with obliquely incident light, which test film is placed in the holder 2 during measurement in such a way that its adhesive layer 5 is directed towards the light source 6. The light source 6 is more precisely intended to illuminate the adhesive layer 5 of the test film 3 at an angle of incidence  $\alpha$  of between 20 and 80 degrees, preferably 60 degrees. In the example shown in Fig. 2, the angle of incidence  $\alpha = 60$  degrees.

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An optical lens 7 is placed between the light source 6 and the measurement zone 4, which lens 7 is designed to parallelize the light beams 12 impacting the test film 3.

- 5 Moreover, a photodetector 8 is intended to register the light intensity of the light reflected from the test film 3. An optical lens 9 is placed between the measurement zone 4 and the photodetector 8, which lens is designed to concentrate the light beams 21 which are reflected from the test film 3 towards the photodetector 8 at an angle of reflection  $\beta$ .

10

- The measurement instrument is further provided with a processor 14 intended to compare the light intensity registered by the photodetector 8 with a predetermined calibration value, and to present a measurement value based on the said comparison, which measurement value represents the degree of covering of dust and dirt on the surface 30 (see Fig. 4). The measurement value is presented in a display window 22 formed in the casing 15, as can best be seen in Fig. 5. The degree of covering of dust and dirt is normally indicated as a percentage of the measurement value (100%) which is obtained on a clean surface, i.e. a surface free of dust and dirt.
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The method according to the invention is carried out in the following stages:

- 25 - in a first stage, a test film 3 coated with an adhesive layer 5 is applied with a predetermined pressure against the surface 30 whose degree of covering of dust and dirt is to be measured, with any dust and dirt particles 31 from the said surface 30 attaching themselves to the adhesive layer 5;
- 30 - the test film 3 is then removed from the said surface 30 and is placed in a holder 2 which, at least during measurement, holds the test film 3 in a plane in a measurement zone 4 defined by the measurement instrument 1,
- a light source 6 illuminates the adhesive layer 5 of the test film 3 with obliquely incident light;
- 35
- a photodetector 8 registers the light intensity of the light reflected from the test film 3; and

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- a processor 14 compares the light intensity registered by the photodetector 8 with a predetermined calibration value, and presents a measurement value based on the said comparison, which measurement value represents the degree of covering of dust and dirt on the surface 30.

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A portable gloss meter of a known type, which measures reflected light from a surface and presents a measurement value in the form of a gloss number, can advantageously be adapted for use as a measurement instrument 1 according to the invention, by means of a holder 2 according to the above description being mounted in the measurement opening of the gloss meter. In this way, a measurement instrument is obtained which is much more compact and easier to handle compared to the known measurement instrument described above with reference to Fig. 1, and it also costs much less on account of the fact that such a gloss meter is manufactured in considerably larger batches. The invention therefore makes available an inexpensive and effective method of measuring cleaning quality, which method can be used to great advantage by cleaning companies for their own monitoring purposes, or by cleaning contractors such as schools, nurseries and hospitals.

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The invention is not limited to the illustrative embodiment described above and shown in the drawings, but can be freely modified within the scope of the attached patent claims. For example, the holder 2 can be designed as a pivotable cover or can be integrated in a protective plate which normally accompanies the gloss meter of the above-described type for the purpose of protecting the measurement opening when the instrument is not in use.

25



## PATENT CLAIMS:

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1. Measurement instrument (1) for measuring the degree of covering of dust and dirt on a surface (30), for example in order to monitor cleaning quality, comprising a holder (2) by means of which a measurement object in the form of a test film (3) is held, during measurement, in a plane in a measurement zone (4) defined by the measurement instrument, the said test film (3) being coated with an adhesive layer (5) which, during testing on the surface (30), is intended to pick up any dust and dirt particles (31) from the said surface, characterized by:

15 - a light source (6) intended to illuminate the adhesive layer (5) of the test film (3) with obliquely incident light;

- a photodetector (8) intended to register the light intensity of the light reflected from the test film (3); and

20

- a processor (14) intended to present a measurement value which represents the degree of covering of dust and dirt on the surface (30), the said measurement value being based on the light intensity registered by the photodetector (8).

25

2. Measurement instrument (1) according to Patent Claim 1, characterized in that the said processor (14) is intended to compare the light intensity registered by the photodetector (8) with a predetermined calibration value, and to present a measurement value based on the said comparison, which measurement value represents the degree of covering of dust and dirt on the surface (30).

30

3. Measurement instrument (1) according to Patent Claim 1, characterized in that the light source (6) is intended to illuminate the adhesive layer (5) of the test film (3) at an angle of incidence ( $\alpha$ ) of between 20 and 80 degrees, preferably 60 degrees.

35

4. Measurement instrument (1) according to one or more of the preceding patent claims, characterized in that, during the measurement,

- 10 -

the test film (3) is placed in the holder (2) in such a way that its adhesive layer (5) is directed towards the light source (6).

5        5.        Measurement instrument (1) according to one or more of the preceding patent claims, characterized in that, during the measurement, the test film (3) is secured without tensioning in the holder (2) by means of securing members (10), in such a way that the adhesive layer (5) of the test film (3) is essentially plane.

10       6.        Measurement instrument (1) according to one or more of the preceding patent claims, characterized in that an optical lens (7) is placed between the light source (6) and the measurement zone (4), which lens (7) is designed to parallelize the light beams (12) which impact the test film (3).

15       7.        Measurement instrument (1) according to one or more of the preceding patent claims, characterized in that an optical lens (9) is placed between the measurement zone (4) and the photodetector (8), which lens is designed to concentrate the light beams (21) which are reflected from the test film (3) towards the photodetector (8).

20       8.        Measurement instrument (1) according to one or more of the preceding patent claims, characterized in that the said predetermined calibration value corresponds to the measurement value for a test film (3) free of dust and dirt.

25       9.        Measurement instrument (1) according to one or more of the preceding patent claims, characterized in that the holder (2) is arranged such that it can move relative to the rest of the measurement instrument (1).

30       10.       Measurement instrument (1) according to Patent Claim 9, characterized in that the holder (2) is arranged such that it can be detached from the rest of the measurement instrument (1).

35       11.       Method for measuring the degree of covering of dust and dirt on a surface (30), for example in order to monitor cleaning quality, comprising the following stages:

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5     - in a first stage, a test film (3) coated with an adhesive layer (5) is applied with a predetermined pressure against the surface (30) whose degree of covering of dust and dirt is to be measured, with any dust and dirt particles (31) from the said surface (30) attaching themselves to the adhesive layer (5);

10    - the test film (3) is then removed from the said surface (30) and is placed in a holder (2) which, at least during measurement, holds the test film (3) in a plane in a measurement zone (4) defined by the measurement instrument (1),

and characterized by the following stages:

15    - a light source (6) illuminates the adhesive layer (5) of the test film (3) with obliquely incident light;

- a photodetector (8) registers the light intensity of the light reflected from the test film (3); and

20    - a processor (14) presents a measurement value which represents the degree of covering of dust and dirt on the surface (30), the said measurement value being based on the light intensity registered by the photodetector (8).

25    12. Method according to Patent Claim 11, characterized in that the said processor (14) compares the light intensity registered by the photodetector (8) with a predetermined calibration value, and presents a measurement value based on the said comparison, which measurement value represents the degree of covering of dust and dirt on the surface (30).

30    13. Method according to Patent Claim 11, characterized in that the light source (6) illuminates the adhesive layer (5) of the test film (3) at an angle of incidence ( $\alpha$ ) of between 20 and 80 degrees, preferably 60 degrees.

35    14. Method according to one or more of Patent Claims 11 to 13, characterized in that, before the measurement, the test film (3) is placed in the holder (2) in such a way that its adhesive layer (5) is directed towards the light source (6).

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15. Method according to one or more of Patent Claims 11 to 14, characterized in that, before the measurement, the test film (3) is secured without tensioning in the holder (2), in such a way that the adhesive layer (5) of the test film (3) remains essentially plane during the measurement.

5

16. Use of a gloss meter (1), of the type which measures light reflected from a surface, as a measurement instrument for measuring the degree of covering of dust and dirt on a surface (30), for example in order to monitor cleaning quality, together with a test film (3) coated with an adhesive layer

10 (5).

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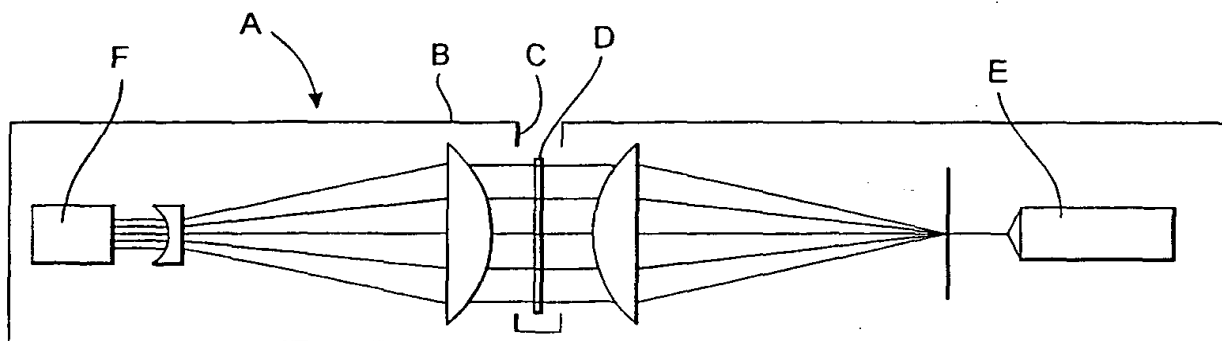


Fig. 1

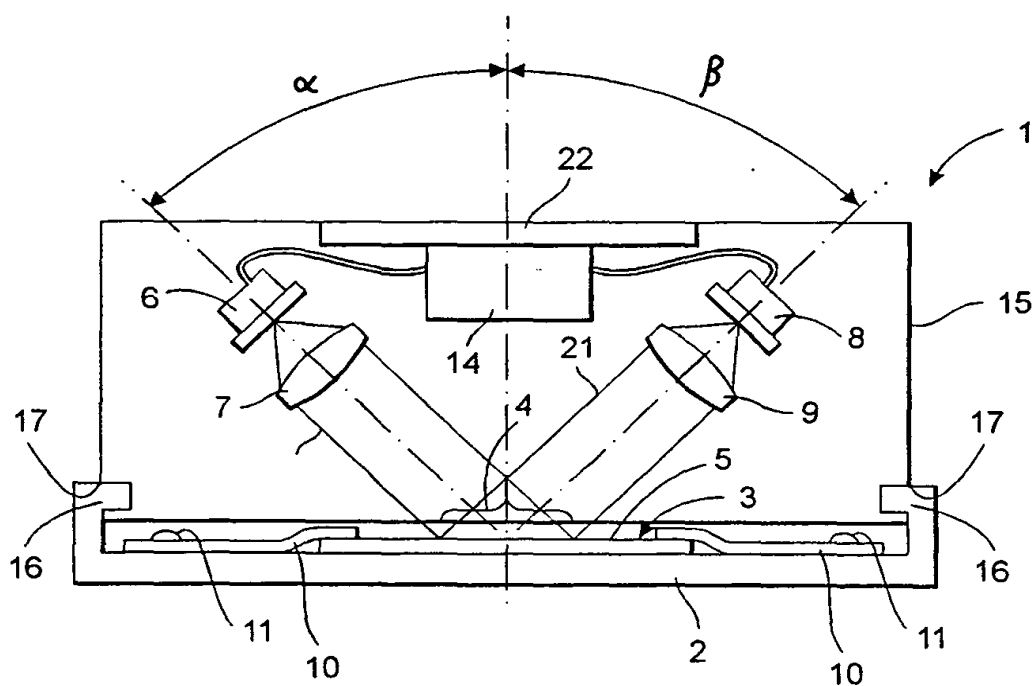


Fig. 2

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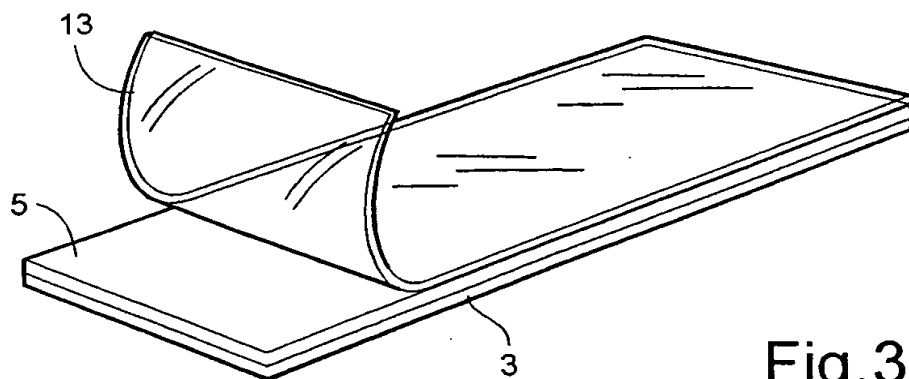


Fig.3

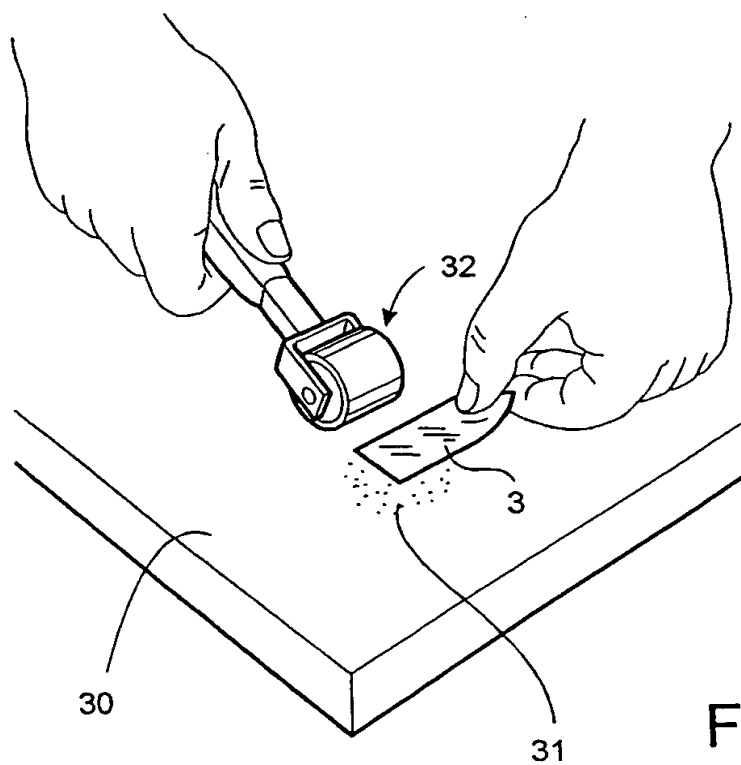


Fig.4

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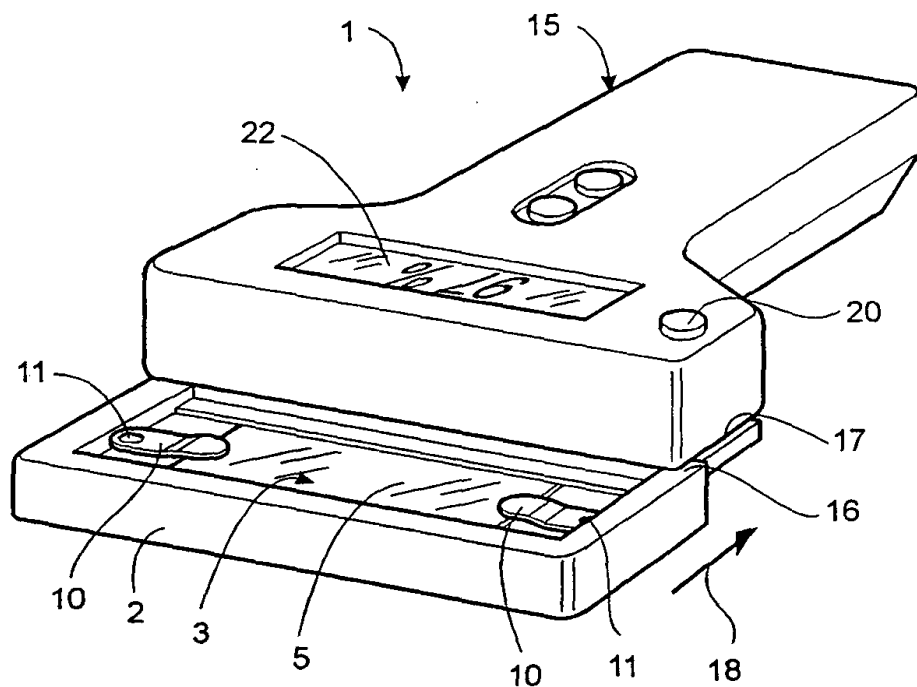


Fig.5

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/02405

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G01N 21/88, G01N 21/55

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0414504 A2 (XEROX CORPORATION), 27 February 1991 (27.02.91), column 10, line 7 - column 11, line 4, figure 3, abstract --	1-16
A	US 5412221 A (IHLEFELD M. CURTIS ET AL), 2 May 1995 (02.05.95), column 3, line 20 - column 4, line 48, figures 1-3 --	1-16

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search

9 March 2000

Date of mailing of the international search report

17 -04- 2000

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Jonas Andersson /itw  
Telephone No. +46 8 782 25 00



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/02405

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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